REMARKS

Claims 1, 8, 19, 26, 29, and 36 have been amended to clarify the meaning of "compliant" or "elastic", depending on the claim. The inventors in the present application used this terminology to describe a layer in contact with a substrate which permits the substrate to thermally deform without stick-slip occurring during lithographic processing. In particular, the compliant layer is sufficiently flexible to allow the compliant layer to deform when the substrate deforms, without any relative movement between the compliant layer and the substrate during lithography processing. Support for amendment of the claims, which provides this description, is present in the Summary Of The Invention at Page 8, lines 1 - 10 of applicant's Specification as originally filed. Several of the claims have been amended so that the claim language is more consistent within the claim with respect to whether it is a substrate which is being processed or a specific embodiment of a substrate which is a wafer. In some instances, obvious typographical errors have been corrected.

Claim Rejections Under 35 USC § 102

Claims 1 - 9, 11 - 14, 17, 19, 21, and 23 - 40 are rejected under 35 USC § 102(b) as being anticipated by U.S. Patent No. 5,452,177, to Frutiger.

Applicant respectfully contend that his invention as described and claimed in the amended claims herein is not anticipated by the Frutiger reference. The Frutiger apparatus is substantially different from that described by applicant, as the Frutiger apparatus is designed to accomplish functions and solve problems which are not related to applicant's invention. For example, at Col. 4, lines 1 - 35, there is a listing of the objects of the Frutiger invention, which include: electrostatic semiconductor wafer clamping which provides efficient thermal transfer; permitting of a relatively high level of incident energy during ion implantation; avoidance of damage to devices on the wafer by charging currents; avoidance of sticking of the wafer to the

electrostatic chuck; providing for release of the wafer; and, exposing of the entire surface of the wafer for processing.

There is no mention of a stick-slip problem of the kind described by applicant. There is no mention of charged particle lithography, and the criticality of avoiding stick-slip which affects such a lithography process. As a result, there is no teaching or even suggestion of applicant's invention.

In particular, the Frutiger reference pertains to an apparatus for electrostatic clamping of a semiconductor wafer in a vacuum processing chamber. The apparatus includes an electrically conductive platen; a resilient, thermally conductive dielectric layer affixed to the platen; and one or more conductive wires positioned on the clamping surface. A clamping voltage is applied between the wires and the platen to firmly clamp the wafer against the clamping surface and depress the wires into the resilient dielectric layer. (Abstract) This clearly shows that the purpose of having a resilient dielectric layer is so that the wires can be depressed into the layer. Further, the definition of "resilient" is something which springs back or rebounds. The main emphasis in the description is with respect to a platen which includes a plurality of platen sections and a means for applying AC clamping voltages with different phases to the platen sections. (Col. 4, lines 46 - 49.) There is considerable description of the conductive electrodes and the AC voltage applied to each of the electrodes to provide means of controlling the clamping force. (Col. 4, lines 49 - 68, continuing at Col. 5, lines 1 - 2.)

Figures 1 - 4 show a typical apparatus which includes a series of "Conductive wires 20, 22, and 24, which are lightly stretched across clamping surface 18 and are attached to a frame member 30. (Col. 6, lines 64 - 66.) The dielectric layer 14 is a soft, thermally conductive polymer layer having a thickness of about 0.003 inch to about 0.010 inch (76 μm to 254 μm), which may be molded into place on the surface of platen 10. (Col. 7, lines 48 - 58.) When the "clamping voltage" is applied, the wafer 12 is drawn against the clamping surface 18, "thereby pressing wires 20, 22, and 24 into resilient dielectric layer 14 and maintaining or increasing the

length of electrical contact between wires 20, 22 and 24 and wafer 12. The resilience of dielectric layer 14 urges wires 20, 22, and 24 against wafer 12 to ensure that a reliable, low resistance contact is maintained". (Col. 8, lines 26 - 34.) It is readily apparent that the reason a resiliant dielectric layer is used is so that the wires can be compressed into the surface of the dielectric layer, as shown in Figures 4A and 4B and be held there by the tendency of the dielectric layer to spring back.

In order to more clearly define what applicant regards as his invention, applicant's independent Claims 1, 8, 19, 26, 29, and 36 have been amended to recite that the compliant layer (or the elastic layer) is one which enables the portion of the electrostatic chuck which contacts the substrate to <u>deform with the substrate during processing when there is thermal deformation of the substrate</u>. Applicants do not want the compliant layer to bounce or spring back. The compliance of applicants' layer avoids relative movement between the substrate and the contacted portion of the electrostatic chuck during such processing. The Examiner proposed that Frutiger teaches a compliant layer. However, the Frutiger layer is a "resilient layer" which permits depression of the conductive wires into its surface, where the thickness of the layer is within the range of 0.003 inch to 0.010 inch (Col. 7, lines 56 - 57), which corresponds to a range of about 76 μm to 254 μm. This is considerably different from applicant's "compliant" layer which is designed to deform as the substrate on the layer deforms and to change shape in concert with the substrate. Further, as applicant's dependent claims provide, the "compliant" layer can withstand a 10 % shear stress without exceeding the yield strength of the layer. In addition, the typical thickness of applicant's "compliant" layer ranges from about 1 μm to 10 μm because the distance of travel of a point on the the substrate against the compliant layer is small in comparison to the depression of wires into a surface in the manner described in the Frutiger reference.

In light of the above distinctions and the amendments made to the claims in the application, applicant respectfully requests withdrawal of the rejection of Claims 1 - 9, 11 - 14, 17, 19, 21, and 23 - 40 under 35 USC § 102(b), over Frutiger.

Claim Rejections Under 35 USC § 103

Claims 10, 15, 16, 18, 20, and 22 are rejected under 35 USC § 103(a) as being unpatentable over Frutiger, in view of U.S. Patent No. 5,581,324, to Miyai et al.

Applicant respectfully contends that applicant's invention is not made obvious in view of a combination of the Frutiger and Miyai et al. references. The deficiencies of the disclosure of Frutiger with respect to the patentability of the presently claimed invention are discussed above. The Miyai et al. reference pertains to an optical system for exposing a photosensitive substrate to radiation through a mask. The problem to be solved is compensating for a change in temperature of the mask, which causes deformation of the mask. (Col. 3, lines 6 - 52, for example.)

The Miyai et al. reference also describes how, once the rate of heating of a mask, and the deformation of the mask, is defined, a computer system can be used in combination with a series of lenses (which are used in combination with the mask) to make adjustments based on the predictable change in the mask. (Col. 12, lines 42 - 55, for example.) One skilled in the art will recognize that the registration of the features relative to each other are fixed by the mask through which irradiation is done (indexed to a point on a substrate).

The Miyai et al. reference is concerned with a change in the projected image from a mask onto a substrate. There is no mention of a stick-slip problem where a substrate changes position upon a substrate holder during imaging, because this is not a problem in the Miyai et al. imaging system. In the Miyai et al. imaging system, the time period during which exposure of the substrate takes place is typically seconds to minutes.

In applicant's imaging system, where there is direct writing of a pattern on a substrate rather than flash exposure imaging through a mask, the imaging time period is typically hours,

and, where charged particle beams impact on the substrate (causing localized heating of the substrate), slipping of a substrate on the support pedestal (electrostatic chuck, for example) is a problem. Since the direct writing takes considerable time compared with imaging through a mask, not only is there localized heating of the substrate, but there is also gradual global heating of the substrate in applicant's case. This combination causes the stick-slip problem which affects the pattern written on the wafer is described in applicant's Specification at Page 6, lines 3 - 20. The unpredictable nature of the stick-slip behavior of the substrate means that it is not possible to solve the problem by the kind of calculated adjustment in pattern writing suggested by the Miyai et al. reference.

Applicants found a way to prevent stick-slip of the substrate from occurring. Once this problem was solved, a computerized system could be used to make adjustments in the imaging process which would permit error correction for localized and global heating of the substrate during the imaging process.

Since there is nothing in either of the two references cited which teaches or even suggests that there is a stick-slip problem with respect to the substrate, and nothing which even suggests a solution to this problem, one skilled in the art reading a combination of these references would not be led in the direction of applicant's invention. Neither Miyai et al. not Frutiger et al teaches nor suggests the use of a deforming, compliant layer on the surface of a substrate support pedestal which deforms with the substrate as means of preventing the substrate from stick-slipping on the pedestal.

Whether taken alone or in combination, neither Frutiger nor Miyai et al. teaches or even suggests applicant's presently claimed invention. In light of the above distinctions, applicant respectfully requests withdrawal of the rejection of Claims 10, 15, 16, 18, 20, and 22 under 35 USC § 103(a), over Frutiger, in view of Miyai et al.

Applicant contends that the presently pending claims as amended are in condition for allowance, and the Examiner is respectfully requested to enter the present amendments and to pass the application to allowance.

The Examiner is invited to contact applicant's attorney with any questions or suggestions, at the telephone number provided below.

Respectfully submitted,

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